ATTACHMENT 10
ENVIRONMENTAL MONITORING PLAN

1.1 General Monitoring Objectives

The Occupational Safety and Health Administration (OSHA) requirements for monitoring uncontrolled hazardous waste sites are codified in title 29, section 1910, paragraph 120 of the Code of Federal Regulations (CFR) stating that monitoring must be performed "where there may be a question of employee exposure to hazardous concentrations of hazardous substances in order to ensure proper selection of engineering controls, work practices and personal protective equipment so that employees are not exposed to levels which exceed permissible exposure limits, or other published exposure limits." Additionally, the RCRA RD&D permit requires monitoring at specific locations.

Information obtained from monitoring during the Munitions Management Device, Version 1 (MMD-1) test is used to ensure that non-stockpile chemical materiel (NSCM) operations are being conducted properly and to detect any conditions that may cause a release of chemical materiel. During such conditions, monitoring data will be used to:

- Stop Operations
- Alert the operators to the problem
- Provide quantitative data to decision makers for responding to and solving the problem
- Predict the impact of a release (such as dispersion of chemical materiel) using chemical materiel alarm patterns/sequences
- Provide historical and quality control (QC) data.

An overriding requirement for the design, development, and implementation of monitoring systems has been the necessity for reliable day-to-day performance. Reliability, in this context, relates to the ability of analytical equipment to perform its intended function when needed.

Selection of monitoring and sampling locations is also critical to a monitoring program. The monitors must be positioned at, and samples collected from, representative points where any released chemical materiel would likely be detected. Air monitoring locations must be selected to provide optimum information and maximum protection for MMD-1 personnel, general public, and the environment.

Air monitoring equipment will be configured to monitor for each specific campaign materiel.

All monitoring equipment used to support MMD-1 test operations must meet the following criteria:

- The monitoring equipment must pass an acceptance test
- The monitoring equipment must pass a 3-day baseline study before use
- The monitoring system must be approved by the Project Manager for Non-Stockpile Chemical Materiel (PMNSCM) (or a designee).

1.1.1 Acceptance Testing Requirements.

Acceptance testing demonstrates the ability of the equipment to properly collect, detect, and quantitate chemical materiel in support of MMD-1 test operations. Acceptance tests will be performed on the following MMD-1 test sampling and monitoring equipment:

- MINICAMS®
- VIKING gas chromatograph/mass selective detector (GC/MSD)
- Hewlett Packard (HP) Dynatherm Gas Chromatograph (GC) analytical systems.
- Colorimetric tubes
- DAAMS tubes

The acceptance test pass/fail criteria for the sampling and monitoring equipment has been specified by the PMNSCM. The PMNSCM will ensure all implemented sampling and monitoring equipment has fully satisfied acceptance test criteria.

If the equipment passes the acceptance test, then it will be included in the 3-day baseline study. If the equipment fails the acceptance test, corrective actions will be implemented and re-testing will be performed. Monitoring and sampling equipment that has not passed an acceptance test will not be used to support MMD-1 test operations. Acceptance tests are only required to pass once for each analyte and will be performed at the approximate location the equipment is designed to monitor. If the equipment is used to monitor for two or more different chemicals, then it must successfully pass an acceptance test for each of the chemicals.

Acceptance tests are not required for any Utah State-certified laboratory owned and operated equipment. However, Utah State-certified laboratory owned and operated equipment documentation will be verified before any samples are shipped.

1.1.2 Baseline Monitoring Requirement

The 3-day baseline study demonstrates the readiness of the instrument, method, and personnel to properly monitor for chemical materiel in samples collected at the MMD-1 test site. The 3-day baseline study includes the Non-Stockpile Systems Contractor (NSSC) air monitoring and mobile chemical laboratory (MCL) personnel. The baseline study will also be used to identify the existence of any instrument operation problems, background interference, and sampling logistics problems. The baseline study will be performed for 3 consecutive days in Building 3445 before the MMD-1 test site receives the first munition for processing.

Simulated MMD-1 test operations will be conducted throughout the baseline study period.

At the start of the 3-day baseline study, the laboratory and monitoring equipment will be set up and calibrated. During the 3-day baseline study, all monitoring equipment will be operated and challenged as if actual MMD-1 test items were being processed. Confirmation samples will also be collected and analyzed, regardless of alarm status. QC for heat-traced sample transfer line challenges will be performed on the first day of the 3-day baseline study and weekly thereafter during normal operations for all sample lines. If re-calibration of monitoring equipment is required due to failing challenges and/or equipment maintenance, documentation will be provided explaining the re-calibration.

The MCL personnel will calibrate all laboratory analysis equipment, and receive, prepare, and analyze air samples from the site. The layout of the MCL is provided in figure 1. Air monitoring personnel spike laboratory quality plant (QP) Depot Area Air Monitoring System (DAAMS) tubes prior to placement in the field. Designated monitoring personnel (designated by the laboratory chief chemist) will spike QP tubes with a 1 time-weighted average (TWA) mass equivalent of chemical agent. During the 3-day baseline study, all historical DAAMS samples, including QPs, are analyzed from each historical DAAMS station. . During normal operations, a daily DAAMS sample from each sampling location, workspace and filters will be analyzed in the event of loss of engineering controls or spill. Weekly DAAMS tubes will be analyzed on a rotational basis. QP samples will be analyzed with the weekly rotational DAAMS requirement. Colorimetric tubes will be sampled as necessary. To verify engineering controls within the MCL, monitoring of personnel exposure will be conducted using MCL DAAMS stations prior to performing the 3-day baseline study. Re-verification of MCL engineering controls will be performed following significant changes in an ongoing operation and/or following any significant change or damage to the MCL ventilation system.

Utah State-certified laboratory owned and operated equipment will not be part of the 3-day baseline study.

The 3-day baseline study is necessary to demonstrate in-control performance of monitoring systems and to identify the presence of interferences. All QC samples will be analyzed, controlled charted, and reported during the 3-day baseline. To pass the 3-day baseline study, the following criteria must be satisfied:

- All site monitoring equipment must meet the calibration and challenge acceptance requirements.
- All monitoring equipment used to support MMD-1 test sample analysis (MINICAMS®, Viking, DAAMS, colorimetric tubes, composite liquid waste samplers, drum thieves, etc.) must be used during the baseline study.
- Only trained monitoring equipment operators will operate the monitoring equipment.
- The MCL must receive and analyze samples from the site that represent **3** days of sampling.
- All MCL analytical equipment used in support of MMD-1 test sample analysis must be used during the baseline study.
- All MCL analytical equipment must meet the calibration and QC sample acceptance requirements.

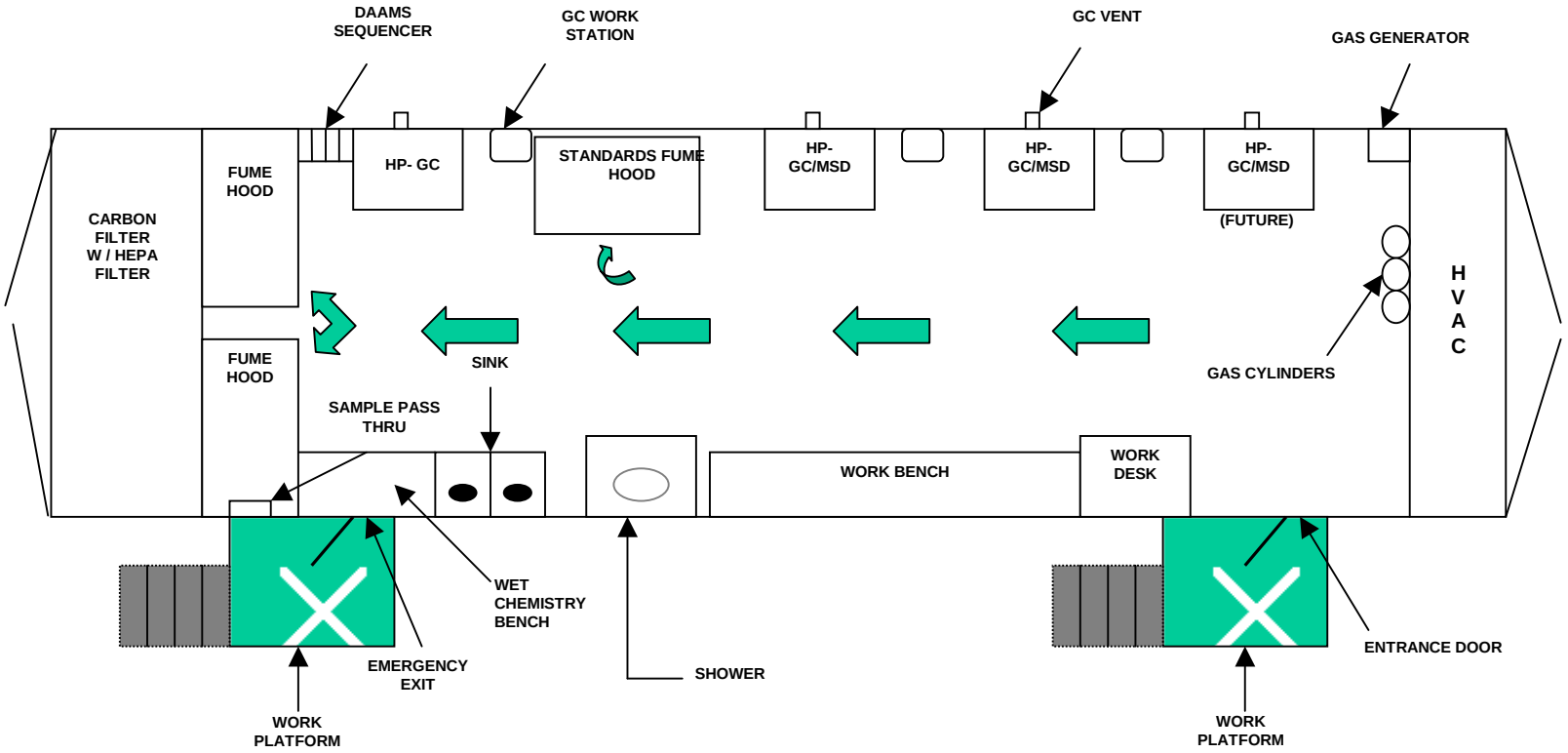


Figure 1. Mobile Chemical Laboratory Layout

1.2 Monitoring Systems Used to Support MMD-1 Test Operations

Air monitoring results from the MMD-1 test site are analyzed to ensure that operations are being conducted in a safe manner and in compliance with the MMD-1 Resource Conservation and Recovery Act (RCRA) research, development and demonstration (RD&D) operating permit. Air monitoring results will be used to determine any conditions that may cause workers to be exposed to chemical materiel vapors from MMD-1 test items.

The monitoring data from MMD-1 test monitoring operations will be used to verify compliance with OSHA, U.S. Environmental Protection Agency (USEPA), Utah Division of Solid and Hazardous Waste (UDSHW), and Department of the Army (DA) regulations.

Field air monitoring procedures rely on four specific types of monitoring:

- Near real-time (NRT) air monitoring
- Confirmation air monitoring
- Historical air monitoring
- Quality control monitoring

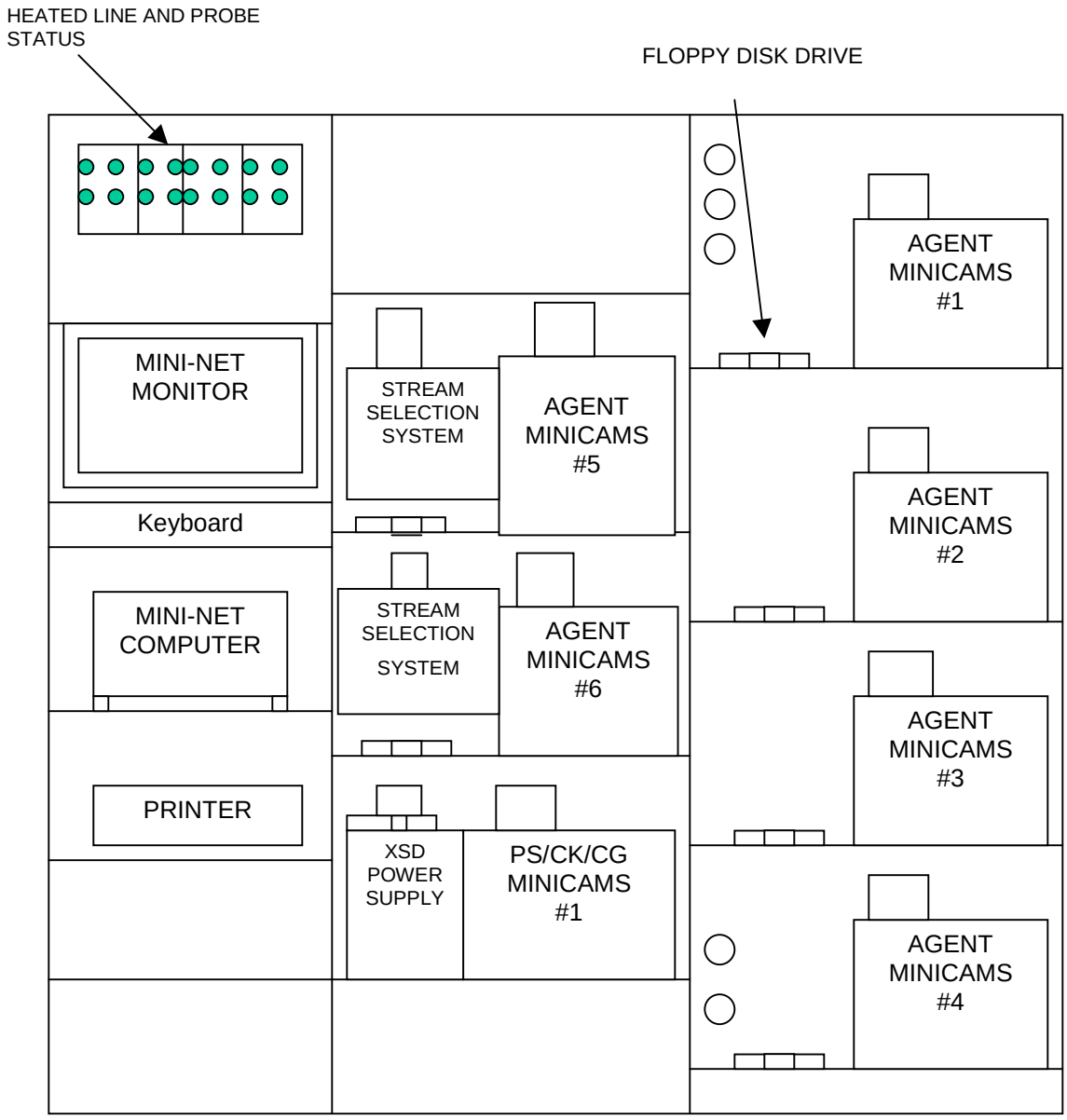
The monitoring equipment used to quantitate an analyte will be calibrated with appropriate calibration standards by air monitoring personnel.

1.2.1 Near Real-Time Air Monitoring Systems.

MINICAMS®, located in two monitoring racks within the monitoring room, provide NRT air monitoring during MMD-1 test operations at Dugway Proving Ground (DPG). The rack mounted MINICAMS® systems, shown in figures 2 and 3, will alarm at 20 percent of the TWA. An additional MINICAMS® will be located in the East Test Chamber immediately adjacent to the unpack area (UPA). This MINICAMS® will provide "gross-level" monitoring within the UPA during unpack operations. The gross-level MINICAMS® will alarm at 20 percent of the immediately dangerous to life and health (IDLH) concentrations for Sarin (GB) and O-ethyl-S-(2-diisopropylaminoethyl) methylphosphonothioate (VX) and at 20 percent of the gross-level detector concentration for distilled mustard (HD). Additional information on unpack area monitoring is provided in paragraph 1.4.7.

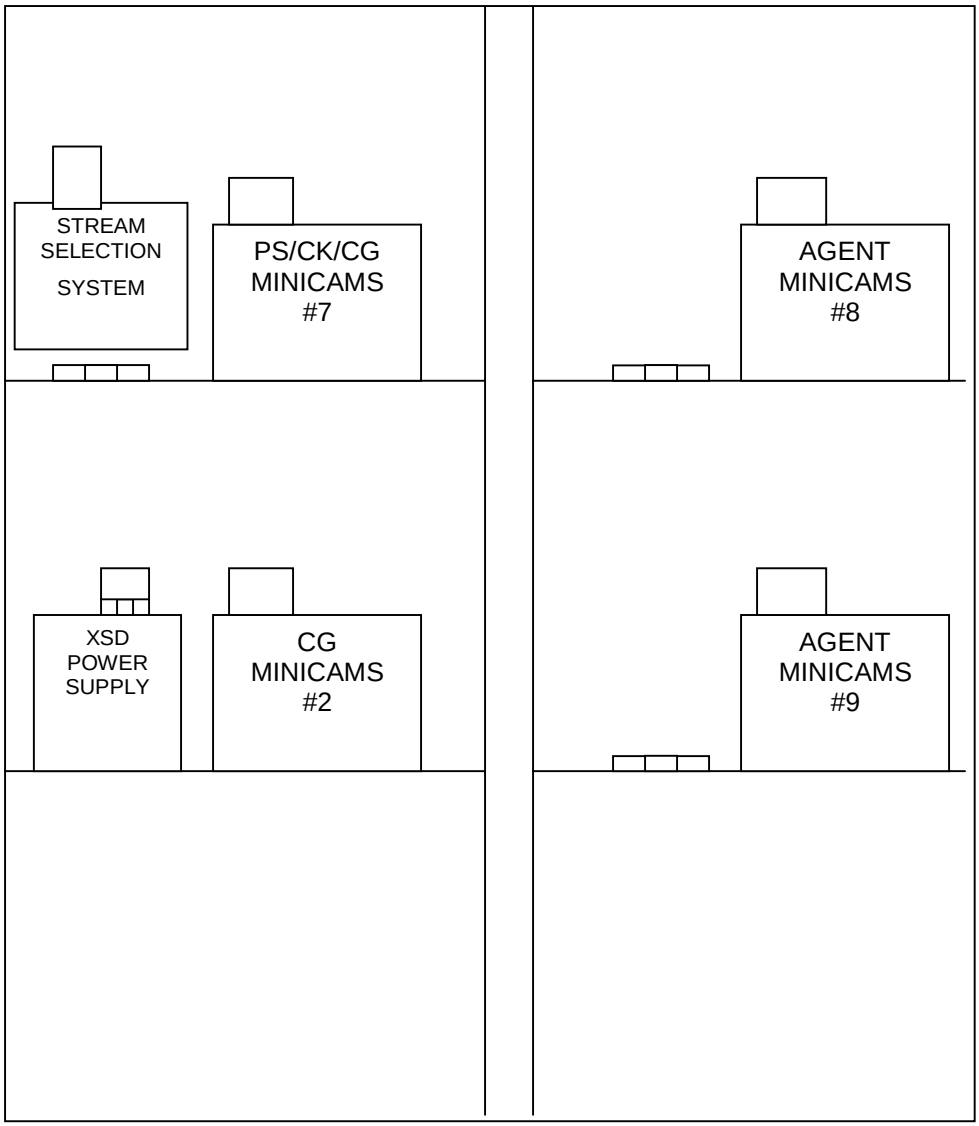
Equipment Description. The MINICAMS® stations will consist of a monitor (sample collection, analysis, detection, and alarm equipment), a vacuum pump, heat-traced sample transfer lines, compressed gases, a stream selection system, a floppy disk drive, and a short range modem.

Analytical Monitoring Method. The MINICAMS® is an automated GC that operates by alternating between sampling and analysis cycles. During the sample cycle, a vacuum pump pulls an air sample into the MINICAMS® through a solid sorbent tube or into a sample loop [phosgene (CG) only] where the analytes are collected. Heat-traced sample transfer lines [heat-traced Teflon tubing that maintains the sample temperature between 50 and 100 C (122 and 212 F)] ensure that chemical materiel being transported down the sample line does not condense or become entrapped in any moisture that may have collected in the lines.



Notes:
The MINICAMS Vacuum pump is located inside the East Test Chamber
All Rack 1 MINICAMS are connected to the MINI-LINK.

Figure 2. Rack 1 Mounted MINICAMS®



Notes:
All Rack 2 MINICAMS are connected to the MINI-LINK
The Gross Level UPA MINICAMS is not located in a rack
The MINICAMS vacuum pump is located inside the East Test Chamber

Figure 3. Rack 2 Mounted MINICAMS®

During the analysis cycle, the solid sorbent tube is heated to thermally desorb the analytes, and nitrogen flows into the sorbent tube to sweep the analytes into the capillary column for analytical separation. The sample loop in a CG MINICAMS® will be maintained at a constant 75 C to prevent condensation; after sample collection, it is flushed with nitrogen in order to carry the analytes into the capillary column. The separated analytes are then carried to the detector. Compressed hydrogen and air fuels the flame of the flame photometric detector (FPD). Air is used as the reducing agent for the halogen selective detector (XSD). The signal from the detector is measured to identify and quantitate any chemical materiel that is present in the sample. If the concentration of the chemical materiel detected is at or above the alarm setpoint, then the MINICAMS® alarm will automatically be activated. The combined MINICAMS® sample and analysis time (total cycle time) varies from 3 to 10 minutes, depending upon the MINICAMS® configuration. Redundant and/or "backup" MINICAMS® are not implemented during MMD-1 testing.

A stream selection system accompanies MINICAMS® that support multiple MMD-1 test operation monitoring locations. The stream selection system provides the capability for a single MINICAMS® to collect samples from different sample locations and still satisfy the Department of Defense (DoD) requirement for 10 minutes or less analysis time for chemical agents and the industry standard of 15 minutes or less for CG. A short-range modem allows the MINICAMS® information to be sent to a computer for electronic data storage in the MINI-NET™ database. The MINI-NET™ records a concentration report at the end of each analytical cycle period. The concentration report will include the date, time, instrument number, sampling port number, error codes (if activated), chemical materiel identity, summary, and MINICAMS® operational mode (RUN, CAL, SER, AL, etc.). The MINI-NET™ also provides the capability of relaying MINICAMS® status information to four annunciator panels located throughout the MMD-1 test site. Daily MINI-NET™ hardcopy reports will be signed by the MINICAMS® operator(s). Routine MINI-NET™ archival of data will be performed by using the MINI-NET™ data archive function and storing the data on a diskette. The MINI-NET™ archive function automatically stores the data in an ASCII format.

The MINICAMS® provides, through local alarm, activation of a malfunction alarm if the system operates outside of parameter limits (flow, temperature, time, etc.) established by the operator.

Calibration Requirements. The MINICAMS® will be calibrated on the first day of each operational week, or whenever two successive 1 TWA daily challenges are outside of the ± 25 percent of the target value, the alarm set-point of 0.2 TWA is not greater than 0.1 TWA or when significant maintenance has been performed [for example, column change, detector change, preconcentrator tube (PCT) change]. MINICAMS will be calibrated and challenged at 1-TWA . Alarm level challenges will also be performed on a daily basis.

Monitoring Locations. The MINICAMS® is the primary ambient air monitor for the MMD-1. The MINICAMS® will operate until MMD-1 test operations in Building 3445 are concluded. MINICAMS® monitoring will be performed at the following locations:

- Building 3445 interior
- Between carbon absorption units
- Process trailer interior
- Between process trailer carbon filter elements
- Munitions treatment vessel (MTV) interior
- Between unpack area carbon filter elements
- Unpack Area Interior (TWA and gross level)
- Anteroom interior
- Between DPG carbon filter elements
- DPG carbon filter exhaust

1.2.2 DAAMS Sample Systems

. The DAAMS stations will be collocated with the MINICAMS® and will be used for historical monitoring or to confirm MINICAMS® alarms. Confirmation DAAMS samples will be collected for every encountered MINICAMS® alarm, with the exception of the MTV interior sample and UPA gross level monitoring locations. All MTV interior and UPA gross level alarms will be considered valid, and appropriate corrective actions will be implemented to reduce chemical materiel vapor concentrations within the MTV or UPA interior.

The MINICAMS® alarm system will be used to warn MMD-1 personnel that a chemical materiel vapor may be present at a level equal to 0.2 TWA. A confirmation sample will be collected and analyzed to determine the validity of the MINICAMS® alarm. If the confirmation sample analysis does not indicate the presence of the chemical, then the alarm is considered a false alarm. If the confirmation sample analysis result indicates the presence of the chemical, then the alarm will be considered valid. Alarms associated with chemical calibrations and challenges will not require confirmation. In the event an alarm confirmation sample cannot be collected (for example, operator error, alarm status cleared prior to colorimetric tube collection, or gross-level baseline contamination), all alarms will be considered valid until operational conditions can disprove them. The alarm confirmation sample results must be reported to the MMD-1 Site Manager, DPG, and the DPG and MMD-1 Site Safety and Health Officer (SSHO. Confirmed sample results at or above the reportable limit (see table 1) shall be reported to UDSHW within 24 hours. A hard copy of the sample analysis results and calculations should also be provided as soon as possible. The Site Manager will notify all required organizations.

If the MINICAMS® alarm is confirmed to have detected chemical materiel concentrations outside of engineering controls, then the PMNSCM, is notified immediately. DPG will be notified of all alarms and confirmation sample analysis results in compliance with DPG's Chemical Accident/Incident Response and Assistance Plan (CAIRAP). Notification procedures will also be in accordance with DPG's CAIRAP.

1.2.2.1 Historical Depot Area Air Monitoring System Equipment Description. The DAAMS tubes will be used as a historical monitoring system during MMD-1 **operational hours.** The DAAMS station will consist of a vacuum pump, sequencer, flow meters, and 12 hour sample tubes. Operational hours means the time from the start to the end of an agent campaign (unless the system is fully decontaminated during an agent campaign) or any time that chemical agent is stored .

A representative historical DAAMS configuration is provided in figure 4. DAAMS tubes requiring analysis will be analyzed in the MCL using an HP Dynatherm GC. The solid sorbent used in DAAMS tubes will be selected specifically to trap the chemical compound of interest. A vacuum pump will be used to draw the air sample through the DAAMS sample tube. A historical DAAMS sample set will be comprised of one primary DAAMS tube and a DAAMS sample duplicate. A QP DAAMS tube will be placed in the field and analyzed once per operational day for each historical DAAMS station.

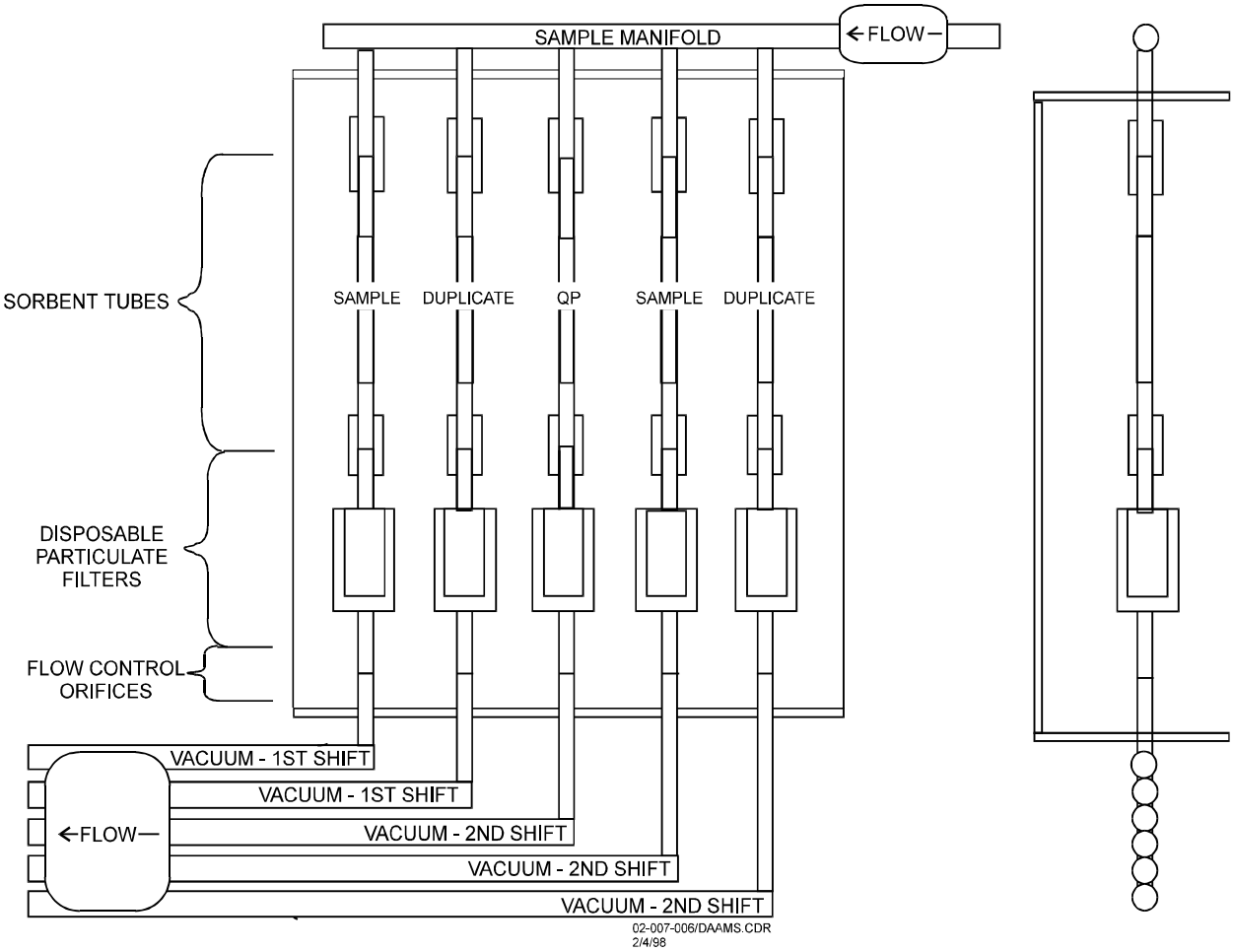


Figure 4. Representative Historical DAAMS Configuration

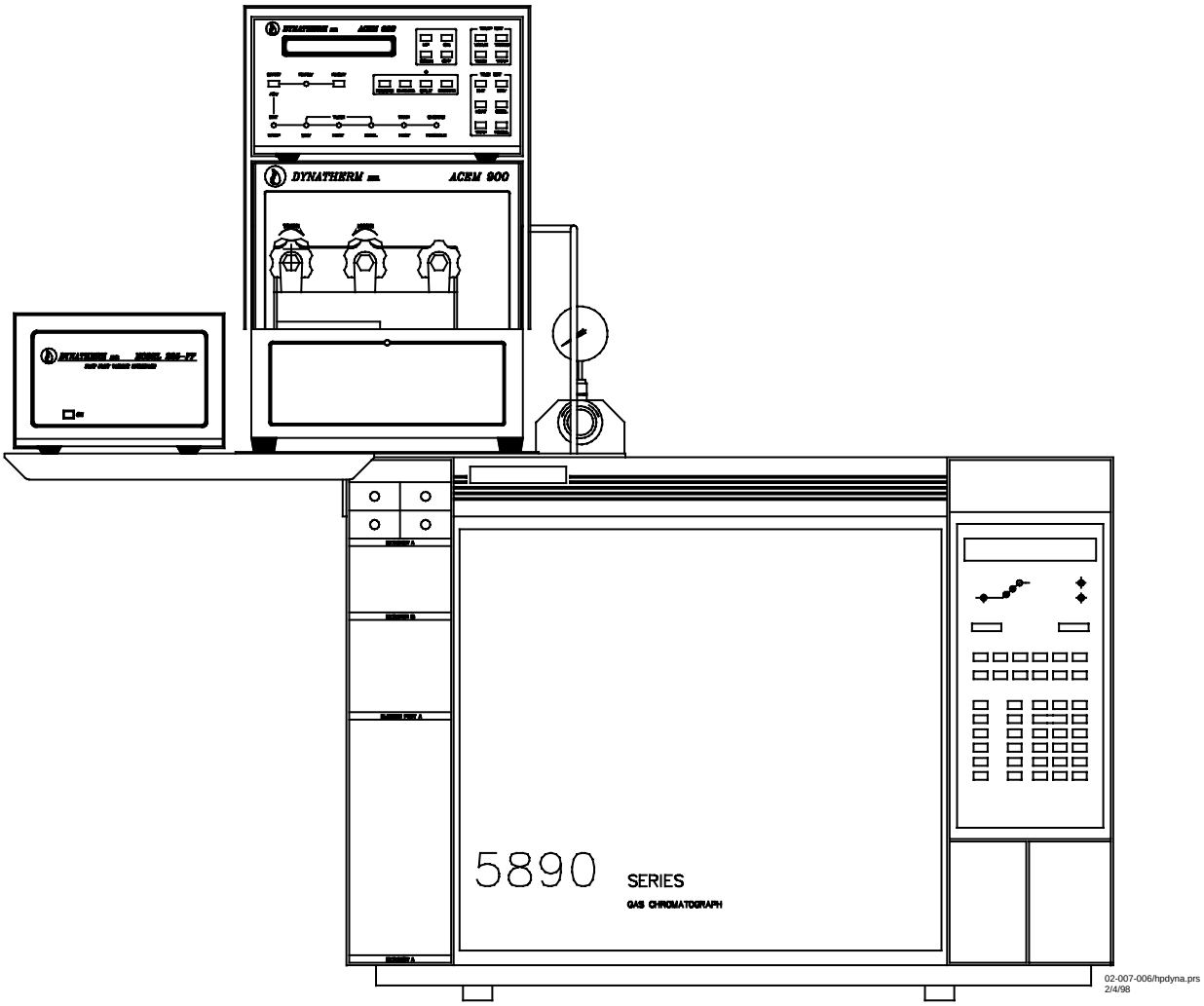


Figure 5. HP Dynatherm Gas Chromatograph

1.2.2.2 Confirmation DAAMS Monitoring. Confirmation DAAMS are used to provide confirmation of a MINICAMS© campaign agent alarm. Confirmation DAAMS tubes are tubes that continuously sample at the same location as the MINICAMS it supports. Confirmation DAAMS tubes unlike the MINICAMS, collects a continuous sample from a specified location. Confirmation DAAMS tubes are analyzed on a weekly rotational basis for each location, if no alarm occurred, with a corresponding QP sample.

1.2.2.3 Depot Area Air Monitoring System GC Analytical Method. After the DAAMS sample is collected, the DAAMS samples will be sent to the MCL for sample analysis and/or sample tube conditioning. DAAMS sample analysis will be performed by directly inserting the DAAMS tube into a calibrated HP Dynatherm GC (figure 5). After the DAAMS tube is inserted into the Dynatherm sample holder, the DAAMS tube will be heated, and the chemical materiel will be thermally desorbed. Nitrogen flows through the heated DAAMS tube to carry the chemical materiel into a focusing trap and into a capillary column. After the chemicals are separated in the capillary column, they are carried to the detector. The detector signal is analyzed to identify and quantitate the chemical materiel present in the sample.

The results of the sample analysis are printed. The HP Dynatherm operator will interpret the sample results by comparing the sample results to the calibration curve data. The DAAMS calibration curve will be verified by spiking and analyzing a 1 TWA mass equivalent QC sample for every 10 DAAMS samples analyzed. This quality laboratory (QL) sample will yield a found concentration within ±15 percent of the target concentration (1 TWA). Two successive failed QL challenges will require the analysis of duplicate sample tubes only. QP DAAMS samples are not required to be re-analyzed. QP samples must be within 75-125 percent of the true value or corrective action must be initiated.

1.2.3 Colorimetric Tubes

Colorimetric Tubes Equipment Description. Colorimetric tubes will be used for confirmation monitoring of CG vapors. The colorimetric tube sampling system will be located at each DAAMS station and will consist of a connection fitting, colorimetric tube, and hand pump. The hand pump will be used to draw a known volume of air into a tube for vapor concentration determination. The sample period for the hand-pumped colorimetric tube will be measured in terms of pump strokes and usually is 2 to 3 minutes per stroke. Figure 6 illustrates colorimetric tube sample equipment. Figure 6 illustrates colorimetric tube sample equipment.

Colorimetric Tube Analytical Method. Colorimetric tubes will be used to confirm a MINICAMS® CG alarm response. When CG is present in the air sample drawn through the tube, CG chemically reacts with the sorbent inside the tube to create a visible color change. The colorimetric tubes will be visually inspected immediately after sample collection to determine the length of color change that was produced. The tubes will only be used once and then disposed of appropriately. Each tube has an instruction sheet provided with the tube that states exactly how many pump strokes are performed when collecting the sample.

Missing the QC collection System

1.2.4 Viking GC/MSD. The Viking GC/MSD is a remotely operated system used to collect and analyze a process sample immediately after a munition is breached. The Viking will perform an AutoTune on a daily basis to ensure detector operability. Viking analyses will be qualitative in nature. The Viking GC/MSD has the capability to collect vapor samples using a sample loop or fixed solid sorbent sample trap. The Viking GC/MSD will be configured for selective ion monitoring of the expected chemical fill. The spectrum generated from sample analysis will be compared to the Viking GC/MSD library, which will contain all MMD-1 test chemical materiels. If the Viking fails to provide process sample verification, the following analytical devices may be used in place of the Viking system:

- MTV interior DAAMS tube analysis
- MTV interior vapor sample bomb analysis
- MTV interior MINICAMS® sample analysis.

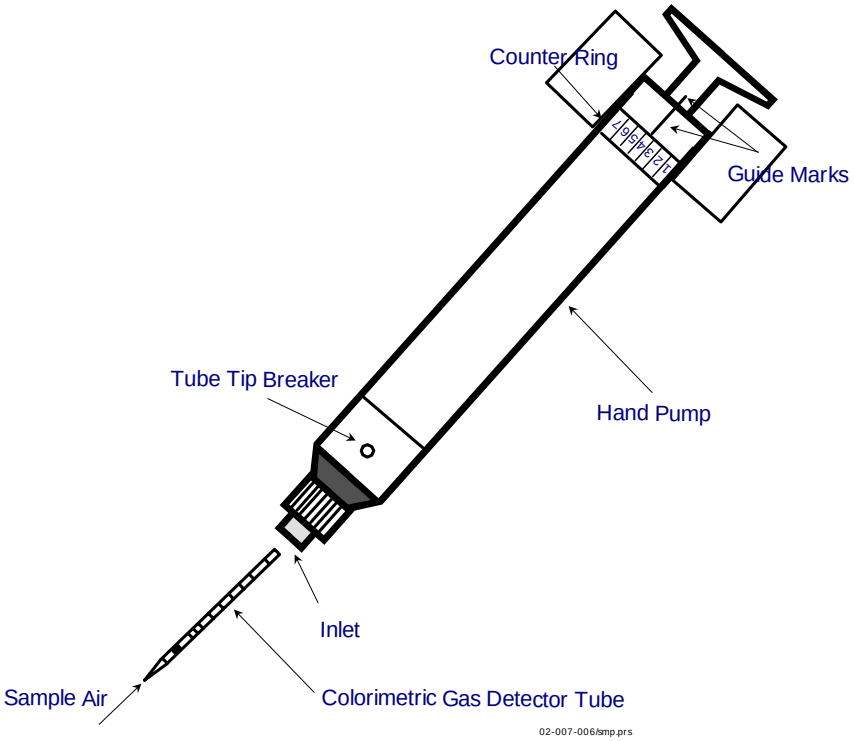


Figure 6. Colorimetric Tube Sampling Equipment

1.3 Monitoring Standards and Control Limits

Chemical materiel contamination can present a significant threat to the safety of workers, the public, and the environment during MMD-1 test operations. Federal and military agencies require monitoring for the release or presence of hazardous chemicals in ambient air during transportation, storage, and disposal of chemical warfare materiel (CWM), and during emergency response activities, to confirm that MMD-1 personnel and the surrounding communities are not exposed to hazardous conditions as a result of MMD-1 test operations.

Contamination of ambient air with GB, VX, HD, or CG vapors may present a hazard if the concentration of airborne contaminants rises above the levels indicated in table 1. The TWA values for each chemical agent are established by the Surgeon General and the TWA for CG is established by National Institute for Occupational Safety and Health (NIOSH). The TWA indicates the level at which exposure to that chemical for 40 hours per week, indefinitely, will not cause adverse health effects. **The TWA for mustard will be considered a ceiling value. The TWA value is under current review.**

For this reason, TWA levels will be used as the action level for air monitoring. For each chemical materiel agent, 20 percent of the TWA value is used as the alarm setpoint to initiate corrective action.

NOTE: All MMD-1 workers will immediately mask upon hearing or seeing a MINICAMS® alarm.

Table 1. MMD-1 Chemical Agent and Industrial Chemical Monitoring Standards and Control Limits

Name	Abbreviation	Classification	Time-Weighted Average[a] (mg/m^3)
Sarin	GB	Nerve Agent	0.0001[b]
O-ethyl-S-(2-diisopropylaminoethyl) methylphosphonothioate	VX	Nerve Agent	0.00001[b]
Distilled mustard	HD	Blister Agent	0.003[b,e]
Phosgene	CG	Industrial Chemical	0.4[c,d]

Notes:[a] Based on an 8-hour time-weighted average
[b] Oak Ridge National Laboratory, 1992
[c] Occupational Safety and Health Administration, 1993
[d] American Conference of Government Industrial Hygienists, 1993
[e] These values are not actual Time Weighted Averages, but reflect limits of quantification. A safe level of worker exposure is unknown at this time.
mg/m^3 = milligram per cubic meter

Table 2 provides a summary of action levels and air monitoring equipment to support MMD-1 test operations.

1.4 Air Monitoring Locations

MMD-1 air monitoring vapor samples will be collected from the following locations:

- Building 3445 interior
- Between the carbon absorption drums
- Between the process trailer carbon filter elements
- Between the unpack area carbon filer elements
- Process trailer interior
- MTV interior
- MSM interior
- UPA interior
- Anteroom interior
- MCL interior
- Between the MCL carbon filter elements
- Between the East Test Chamber first and second carbon filter elements
- East Test Chamber filter exhaust

Table 2. MMD-1 Time-Weighted Average and Air Monitoring Equipment

Chemical	TWA (mg/m^3)	Detector Type	Approximate Cycle Time (min)[a]	Confirmation Method
HD[b]	0.003	FPD	5	DAAMS (GC/FPD or MSD)
GB	0.0001	FPD	10	DAAMS (GC/FPD or MSD)
VX	0.00001	FPD	10	DAAMS (GC/FPD or MSD)
CG	0.4	XSD	4	Colorimetric tube

Notes:

[a] Cycle times are for a single analysis at one location only

[b] **These values are not actual Time Weighted Averages, but reflect limits of quantification. A safe level of worker exposure is unknown at this time.**

DAAMS = Depot Area Air Monitoring System
FPD = flame photometric detector
GC = gas chromatograph
mg/m^3 = milligram(s) per cubic meter
MSD = mass selective detector
TWA = time-weighted average
XSD = halogen selective detector

Air monitoring locations and monitoring equipment used to monitor each location are summarized in table 3. Figure 7 provides a monitoring layout for sample locations.

MMD-1 air monitoring will be performed by using MINICAMS®/DAAMS stations and DAAMS only monitoring stations. Approximate heat-traced sample line lengths for each location are provided in table 4.

1.4.1 Building 3445 Interior.

The MINICAMS® sample collection point for monitoring the interior of Building 3445 will be located in the proximity between the UPA and the process trailer. A heated sample probe connects to a heat-traced sample transfer line, which penetrates the building and connects to the equipment located in the monitoring room. A DAAMS station mounted inside the East Test Chamber provides confirmation DAAMS, historical DAAMS, and colorimetric tube sample collection.

1.4.2 Between Process Trailer Carbon Filter Elements.

MINICAMS and DAAMS confirmation monitoring will be used to monitor between the process trailer carbon filter elements. Detection and confirmation of agent at or above 0.2 TWA between the carbon filter elements requires "bag-in/bag-out" replacement of the first filter element. The second filter element may be moved to the first element position and a new second filter element may be installed. All filters must be leak checked before the process may resume.

DAAMS confirmation will be performed by analyzing the DAAMS in accordance with the DAAMS **analytical method described in paragraph 2.2.2.3**

1.4.3 Between the Unpack Area Carbon Filter Elements

MINICAMS and DAAMS monitoring will be used to monitor between the unpack area carbon filter elements. Detection and confirmation of agent at or above **0.2** TWA between the carbon filter elements requires "bag-in/bag-out" replacement of the first filter element. The second filter element may be moved to the first element position and a new second filter element may be installed. **All filters must be leaked checked before the process may resume**

Table 3. Air Monitoring Locations and Monitoring Equipment Type

Monitoring Location	MINICAMS® (Yes/No)	Confirmation DAAMS/CT Sample (Yes/No)	Historical DAAMS Sample (Yes/No)
Building 3445 Interior (East Chamber only)	Yes	Yes	Yes
Between Carbon Absorption Units	Yes	Yes	No
Process Trailer Interior	Yes	Yes	Yes
MTV Interior	Yes	No	No
Between Process Trailer Carbon Filter Elements	Yes[a]	Yes[a]	No
Munitions Service Magazine	Yes	Yes	No
Between Unpack Area Carbon Filter Elements	Yes[a]	Yes[a]	No
Unpack Area Interior	Yes	Yes	Yes
Anteroom Interior	Yes	Yes	No
Between DPG Carbon Filter Elements	Yes[a]	Yes[a]	No
DPG Carbon Filter Exhaust	Yes[a]	Yes[a]	Yes
Mobile Chemical Laboratory Interior	No	No	Yes
Mobile Chemical Laboratory Filter Midbed	No	No	Yes
Unpack Area Gross Level	Yes[a]	No	No

Notes:
[a], CG monitoring not performed at these locations
DAAMS = Depot Area Air Monitoring System
DPG = Dugway Proving Ground

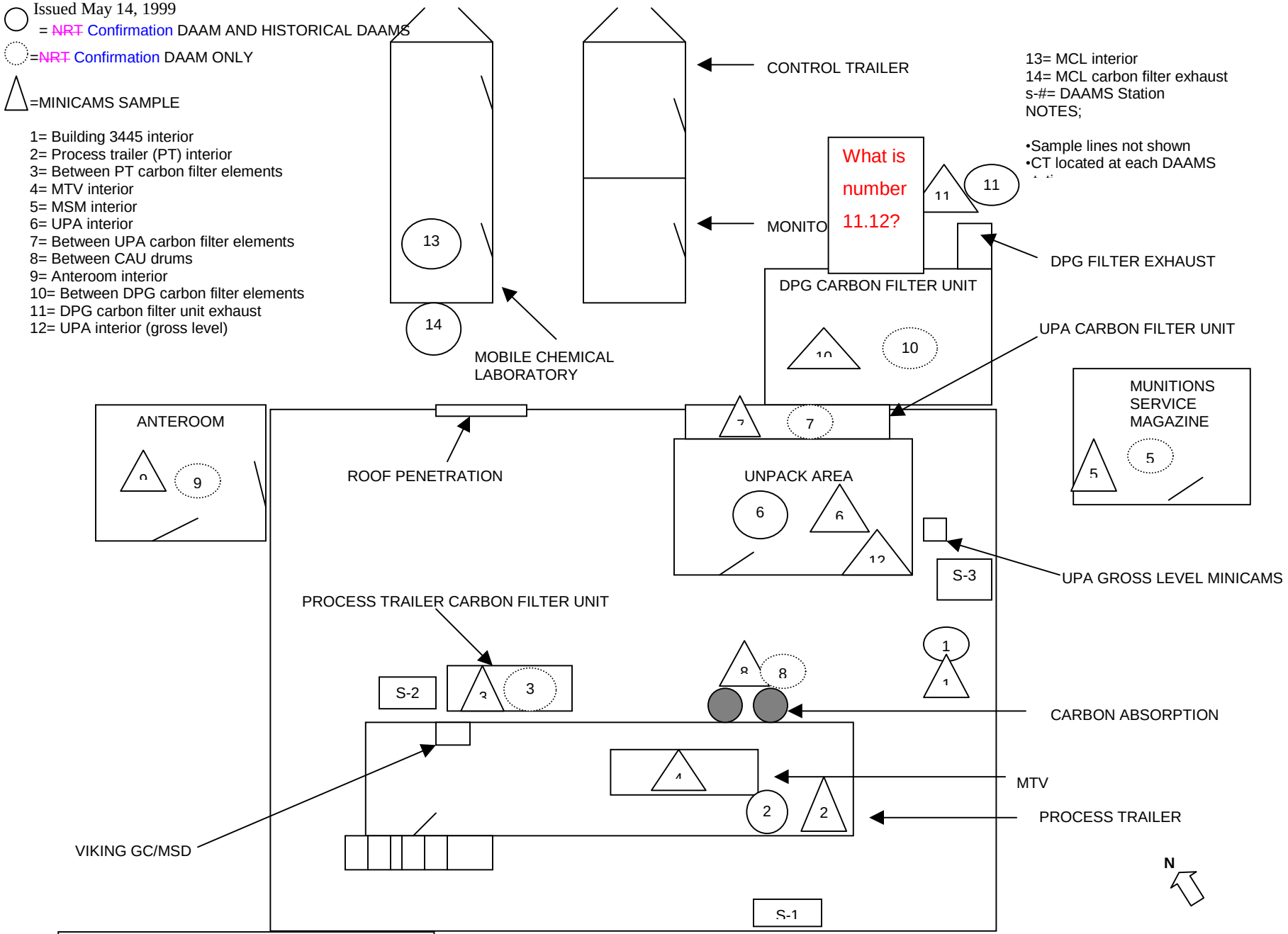


Figure 7. Monitoring Layout

Table 4. Approximate Heat-Traced Sample Line Lengths for Each Monitoring Location

Monitoring Location	Approx. MINICAMS® HTSL Length (ft)	Approx. DAAMS HTSL Length (ft)	Equipment Location
Building 3445 Interior (East Chamber only)	150	NA	MINICAMS = Rack DAAMS = Inside East Chamber
Between Carbon Absorption Units	150	10	MINICAMS = Rack DAAMS = Inside East Chamber
Process Trailer Interior	150	55	MINICAMS = Rack DAAMS = Inside East Chamber
MTV Interior	150	NA	MINICAMS = Rack DAAMS = NA
Between Process Trailer Carbon Filter Elements	150	10	MINICAMS = Rack DAAMS = Inside East Chamber
Munitions Service Magazine	150	80	MINICAMS = Rack DAAMS = Inside East Chamber
Between Unpack Area Carbon Filter Elements	150	10	MINICAMS = Rack DAAMS = Inside East Chamber
Unpack Area Interior (TWA)	150	25	MINICAMS = Rack DAAMS = Inside East Chamber
Anteroom Interior	150	NA	MINICAMS = Rack DAAMS = Inside East Chamber
Between DPG Carbon Filter Elements	150	50	MINICAMS = Rack DAAMS = Inside East Chamber
DPG Carbon Filter Exhaust	150	50	MINICAMS = Rack DAAMS = Inside East Chamber
Mobile Chemical Laboratory Interior	NA	NA	MINICAMS= NA DAAMS = Inside MCL

Monitoring Location	Approx. MINICAMS® HTSL Length (ft)	Approx. DAAMS HTSL Length (ft)	Equipment Location
Mobile Chemical Laboratory Filter Midbed	NA	10	MINICAMS = NA DAAMS = Inside MCL
Unpack Area Gross Level	10	NA	MINICAMS = Inside East Chamber DAAMS = NA

Table 4. Approximate Heat-Traced Sample Line Lengths for Each Monitoring Location (Cont.)

Notes:

DAAMS = Depot Area Air Monitoring System
HTSL = heat-traced sample line
MCL = mobile chemical laboratory
NA = not applicable
TWA = time-weighted average

1.4.4 Process Trailer Interior.
MINICAMS® , **Confirmation** DAAMS, and Historical DAAMS will be used to monitor the process trailer interior for chemical agent vapor concentration. The specific monitoring location will be at the proximity of the inlet to the process trailer carbon filter system. This location is most negative with respect to atmospheric conditions within the process trailer and is the most likely agent migration pathway. The sample location uses a heated probe connected to a heat-traced sample transfer line that penetrates the process trailer, penetrates Building 3445, and connects to the sampling equipment located in the monitoring room and East Chamber. **Confirmation samples will be collected from the same location as the MINCAMS.** If CG confirmation is required and the alarm status of the MINICAMS® is cleared prior to collecting a vapor sample, the MINICAMS® alarm is considered valid unless process **confirmation** can prove otherwise. **Calibrations and challenges of the MINICAMS does not require confirmation tubes analyzed.**

1.4.5 Munitions Treatment Vessel.
The MTV interior will be monitored with MINICAMS® after munition processing and MTV rinsing has been completed (demand only). The MTV interior MINICAMS® will collect a sample from the gas processing piping exiting the MTV tooling towers. A heated sample probe connects to a heat-traced sample transfer line, penetrates the processes trailer, penetrates Building 3445, and connects to the monitoring equipment located in the monitoring room.

Confirmation of an MTV interior MINICAMS® alarm is not required. MTV interior alarms are considered valid alarms, and corrective actions are implemented to reduce chemical materiel vapor concentrations (such as, addition of additional reagent, additional rinsing, and increase re-circulation time). If repeated alarms are observed, additional vapor samples may be collected.

1.4.6 Munitions Service Magazine. The MSM will be monitored with MINICAMS® and DAAMS prior to and during personnel entry into the MSM. The MINICAMS® heat-traced sample transfer line penetrates the MSM and connects to the sampling equipment located in the monitoring room.

Confirmation sampling will be performed by collecting a DAAMS in the event a MINICAMS alarm is observed. If CG confirmation is required and the alarm status of the MINICAMS® is cleared prior to collecting a vapor sample, the MINICAMS® alarm will be considered valid unless process **confirmation**

can prove otherwise. **Calibrations and challenges of the MINICAMS does not require confirmation tubes analyzed.**

1.4.7 Unpack Area Interior

The UPA will be monitored with two MINICAMS®, **Confirmation** DAAMS, and historical DAAMS. Workers in the UPA will have Level A protection as described in Attachment 7, Table 7-3. One MINICAMS® will be configured for gross-level monitoring at 0.2 mg/m^3 for GB and HD and 0.02 mg/m^3 for VX.[1] The gross level MINICAMS® will be located in the proximity of the UPA and will maintain a heat-traced sample transfer line that penetrates the UPA and connects to the gross-level MINICAMS®. The gross level MINICAMS® will be used to monitor for potential leaking items during unpack operations. Once unpack operations indicate a leaking item is not present or decontamination and appropriate containment of a leaking item provides zero readings on the gross-level MINICAMS®, lower level TWA MINICAMS® **(0.2 TWA)** monitoring will be performed until the item and unpack personnel have exited the UPA. A MINICAMS® will be used for TWA monitoring of the UPA. This MINICAMS® has a heat-traced sample transfer line that penetrates the walls of the UPA and Building 3445 and connects to the monitoring equipment located in the monitoring room. Wall pentrations are sealed.

Confirmation of gross-level MINICAMS® alarms is not required. A gross-level MINICAMS® alarm will be considered valid and appropriate decontamination and containment procedures will be implemented. DAAMS confirmation samples will be collected and analyzed for **0.2** TWA MINICAMS® alarm responses.

Unpack area MINICAMS® exhausts (gross-level and TWA MINICAMS®) are routed to a carbon filter unit.

1.4.8 Anteroom Interior. The anteroom interior will be monitored with MINICAMS® and **Confirmation** DAAMS. A heat-traced sample transfer line penetrates Building 3445 and connects to the monitoring equipment located in the monitoring room. This monitoring location is used to monitor personnel during entry/egress from the East Test Chamber. Items leaving the East Test Chamber can be headspaced monitored in accordance with Army requirements prior to exiting the anteroom.

Confirmation sampling will be performed by collecting **Confirmation** DAAMS in the event a MINICAMS alarm is observed. If CG confirmation is required and the alarm status of the MINICAMS® is cleared prior to collecting a vapor sample, the MINICAMS® alarm is considered valid unless process **confirmation** can prove otherwise.

[1] "Gross-level" CG monitoring within the UPA will not be required. CG processed during MMD-1 test operations will be shipped and stored in accordance with Department of Transportation (DOT) requirements.

1.4.9 Carbon Absorption Unit Drums.

The carbon absorption unit drums (CAU) drums will be monitored with MINICAMS and **confirmation** DAAMS. A heat-traced sample transfer line penetrates between the two CAU drums, penetrates Building 3445 and connects to the monitoring equipment located in the monitoring room.

Confirmation sampling will be performed by collecting a **confirmation**- DAAMS in the event a MINICAMS alarm is observed. If CG confirmation is required and the alarm status of the MINICAMS® is cleared prior to collecting a vapor sample, the MINICAMS® alarm is considered valid unless process **confirmation** can prove otherwise.

1.4.10 Between DPG First and Second Carbon Filter Elements.

MINICAMS and DAAMS confirmation monitoring will be used to monitor between the DPG carbon filter elements. Detection of agent at or above **0.2** TWA between the carbon filter elements requires the MINICAMS to be dedicated to the DPG carbon filter exhaust.

DAAMS confirmation will be performed by analyzing the DAAMS in accordance **with the DAAMS analytical method described in paragraph 2.2.2.3.**

1.4.11 DPG Carbon Filter Exhaust.

Once chemical agent is confirmed between the DPG carbon filter elements, MINICAMS and **Confirmation** DAAMS monitoring is focused at the DPG carbon filter exhaust.

DAAMS confirmation will be performed by analyzing the **DAAMS in accordance with the DAAMS analytical method described in paragraph 2.2.2.3**. Confirmed agent readings **above 0.2 TWA** at the DPG filter exhaust requires implementation of the DPG CAIRP.

1.4.12 Mobile Chemical Laboratory .

The MCL is designed for Research, Development, Test, and Evaluation dilute chemical agent concentrations and will be monitored with DAAMS tubes at the workspace and between the MCL carbon filter elements. MCL workspace DAAMS will be collected and analyzed in the event of a spill or loss of engineering control. The MCL filter DAAMS will be collected and analyzed on a weekly basis**. Detection of agent above the 0.2 TWA level will initiate corrective action. QP samples will be analyzed on a weekly basis for each location.**

1.5 Quality Control Sample Requirements

After calibration, if an instrument is used to quantitate the amount of chemical materiel in a sample, then it will be subjected to periodic QC sample analysis to check the measurement process from sample collection through analysis. QC samples provide data that can validate the results of the analysis of an actual sample. The QC samples will be used to:

- Evaluate the accuracy and precision of analytical data to establish the quality of the data
- Provide an indication of the need for corrective actions
- Determine the effectiveness of corrective actions when they are implemented.

The MCL supporting MMD-1 operations use numerous types of QC samples to inspect the measurement process. The following types of QC samples for agent analysis include, but are not limited, to the following:

- Blanks
- Calibration checks (quality laboratory sample/continuing calibration verification)
- Duplicate sample analysis
- Laboratory spikes (**QL** samples).
-
- **Laboratory field spikes (QP Samples)**

RCRA waste analysis QC samples will be performed in accordance with the Utah State-certified laboratory requirements.

Detailed information on QC sample requirements is provided in section 4-C of the MMD-1 permit application.

1.6 Process Sample Locations

Process samples will be collected periodically to determine process conditions. Liquid and vapor process samples will routinely be collected and analyzed. Vapor process samples may be collected from the following locations:

- MTV interior
- Liquid reactor vessel (LRV) interior
- Relief vent tank
- Waste gas knockout drum
- Carbon adsorption unit.

Vapor process samples may be collected using a 150 milliliter vapor sample bomb, Tedlar gas sample bag, and/or DAAMS tube located in a sample collection panel on the outside of the process trailer. Air monitoring personnel and control room operators will coordinate all vapor process sampling efforts.

A liquid process sample will be collected using a 150-milliliter liquid sample bomb or other suitable container from either the MTV and/or LRV. Each liquid type (neutralent, rinse water, reagent, etc.) will be collected and analyzed for chemical materiel content prior to being transferred to a surge tank for holding purposes. Liquid material transfer will be dependent on sample analysis results. **The concentration of the waste must be less than 1 ppm.** Liquid and vapor sample collection points are located within the process trailer sample collection panel. Prior to sample collection, procedures will be implemented to recirculate samples prior to collection. This recirculation helps to ensure a representative sample is being collected.

A liquid sample will be collected at the surge tank for chemical materiel screening and subsequent offsite RCRA characterization. Offsite RCRA characterization will be performed by a Utah State-certified laboratory. Utah State-certified RCRA analysis will be performed in accordance with the most current **SW-846 methods.** MCL quality control acceptance for laboratory generated data is identified in table 5.

To ensure the integrity of samples collected, samples must be collected in properly cleaned containers, promptly and properly preserved, and transported to MCL so that the chance for significant changes in constituents is minimized. Proven sampling, preservation, and shipping methods that comply with USEPA and DOT specifications will be used. Samples sent offsite are packed with appropriate transportation labels (hazardous waste and DOT hazard labels, when appropriate). The sample is accompanied by the correct chain-of-custody (COC) forms. The NSSCM monitoring team is responsible for proper sample collection, documentation, preservation, and transportation.

All samples will be collected, contained, preserved, transported, received, prepared, and analyzed in accordance with the most recent USEPA guidance and PMNSCM requirements. Samples will only be sent off-site if agent levels are below those specified in III.C.5. of the RD&D permit.**(<1 ppm). The actual chemical concentration will be reported to the laboratory for each compound. MDL/IDL values may have qualifiers associated with them to help the laboratory make risk management decisions.**

1.7 Field Monitoring Procedures

Prior to MMD-1 operations in Building 3445, the air monitoring equipment will be required to undergo a baseline monitoring assessment to verify that all of the monitoring systems are prepared to accurately detect the presence of chemical materiel vapor.

Table 5. MCL Quality Control Acceptance for Laboratory Generated Data

Acceptance Criteria for Agent Spike and Recovery Analyses[a]			
Analysis Method	ICV/CCV (or QL for DAAMS Analysis)	Laboratory Control Samples	Matrix Spike Samples (QP for DAAMS)
GC/MS (liquid extracts)	85-115 %	85-115 %	75-125 %
GC/FPD (DAAMS or MINICAMS®)	85-115 %	**85-115% (DAAMS)**	75-125 %

NOTE:
a **Acceptance** criteria for percent recovery of the target analyte from the true value. The methods for agent analysis have not been field tested**If during baseline, ranges are different than the above listed values, DSHW will be notified for Executive Secreatry approval prior to processing**

CCV = continuing calibration verification
DAAMS = Depot Area Air Monitoring System
FPD = flame photometric detector
ICV = initial calibration verification
QL = quality lab
QP = quality plant

Acceptance Criteria for Agent Duplicate Analyses[b]

Analysis Method	Laboratory Control Samples	Matrix Spike Samples	Field Duplicates
GC/MS (liquid extracts)	+/-20%	+/-20%	+/-20%

NOTE:

b Proposed acceptance criteria for relative percent difference (RPD) of the duplicate analyses are listed. The methods for agent analysis have not been field tested. Actual duplicate RPDs may vary according to matrix and agent. **RPD requirement will need to be submitted during baseline and approved by the Executive Secretary prior to processing.**

1.7.1 Site Sampling for Interferences During Baseline Studies.

Chemical interferences present in Building 3445 could cause unnecessary false positive and/or false negative readings for air monitoring equipment measurements. This problem is assessed during the 3-day baseline study by collecting and analyzing DAAMS samples and performing heat-traced sample transfer line challenges. The time of day for sampling will be selected to match the greatest amount of activity expected during MMD-1 test activities. Each day's DAAMS samples will be analyzed by MCL operators.

Results indicating significant background interferences for monitoring will be immediately reported to the MMD-1 site manager. If possible, the source(s) of the interference(s) will be identified, eliminated, or controlled.

1.7.2 Initial Startup of Monitoring Equipment.

The MINICAMS®, gas supply system, stream selection system, confirmation sample stations, and sampling and return lines will be inspected for evidence of physical damage. Where damage is noted, broken items will be repaired or replaced immediately. Routine preventive maintenance operations, such as replacing MINICAMS® PCTs, will also be completed at this time. A MINICAMS® that is not operable within 120 minutes will be replaced. The MMD-1 Site Manager will evaluate the status of a non-operational MINICAMS®. The MMD-1 Site Manager will determine if the status requires the process to reach a "standby" condition or if the process can continue until completion. Monitoring equipment must satisfy the limiting conditions of operation for the MMD-1.

The stream selection systems and the heat-traced sample transfer lines will be turned on and allowed to warm up for a minimum of 30 minutes.

Vacuum pumps will be turned on and allowed to run throughout the inspection period. The flow rate of air through each sampling line will be measured using a calibrated flowmeter and corrected to specified setpoint values, as necessary.

The computer printer and floppy disk drive connections to the MINICAMS® will be verified and each unit will be turned on and allowed to warm up. The supply of hydrogen, purified air, and nitrogen gas from the compressed gas cylinders to the MINICAMS® will be established.

After each MINICAMS® unit is powered on, the operating parameters for each MINICAMS® will be reviewed, adjusted to specified parameters, and printed out. The printouts are placed into permanent storage in the appropriate MMD-1 monitoring files. The MINICAMS® analysis protocols are adjusted at this time if significant interferences have been identified.

Monitoring equipment will then be calibrated as described in the most current revision of the monitoring standard operating procedures (SOPs).

Heat-Traced Sample Transfer Line Challenge. Heat-traced sample transfer lines will be challenged to verify that transmission of chemical materiel from the sampling points to the MINICAMS® is acceptable. The distal ends of all sample transfer lines will be challenged separately with 1 TWA for each chemical materiel during the 3-day baseline study and every ~~7~~ days thereafter. Each heat-traced sample transfer line will be considered ready for operations if the MINICAMS® readings and DAAMS readings are within 25 percent of the referenced challenge level for each chemical. If unacceptable readings are obtained, a second challenge will be made for the chemicals that were out of range. If the readings continue (more than two failed readings) to be unacceptable, corrective actions will be implemented to improve transmission efficiency.

1.7.3 Daily Startup.

MINICAMS® will be routinely calibrated on the first day of each operational week. At the beginning of all subsequent site operational days, each MINICAMS® will be challenged at a 1 **and 0.2** TWA monitoring level by air monitoring personnel, with the exception of the gross-level UPA MINICAMSThe gross-level MINICAMS® will be challenged at the IDLH or gross-level detector (GLD) monitoring level. When the MINICAMS® are ready for operations, the stream selection systems are set to monitor appropriate areas in the operator specified sequence. All calibrations, **and 1 TWA challenges,** with the exception of the first calibration point, must be within 75-125 percent of actual value to be considered valid. **The alarm set-point of 0.2 TWA must be greater than 0.1 TWA to be considered valid.**

Historical DAAMS sample tubes will be placed in each sampling station and the sampling station sequencers will be initialized to zero and started at the beginning of operational hours. **Confirmation tubes will be changed every hour if no alarm sounded. Confirmation tubes will be analyzed weekly for each station if no alarm occurred. Confirmation tubes must be able to analyze for a one cycle MINCAMS alarm.**

1.7.4 MMD-1 Operations.

MINICAMS® Operations. MINICAMS® cycle between sample collection and analysis on an ongoing basis until MMD-1 operations are concluded. Compressed gases, chemical reagents, and other consumables associated with daily MINICAMS® operation will be replenished as needed.

Confirmation *and Historical DAAMS Sample Collection and Analysis.* **Confirmation** DAAMS samples will be collected for any observed MINICAMS® alarm. Additionally, all historical DAAMS will be collected and analyzed. Samples that are collected from the field and are not analyzed will be thermally conditioned prior to re-use in the sample field. One out of every ten thermally conditioned DAAMS tubes will be analyzed to demonstrate no detectable responses at or above the DAAMS method limit of quantification.

A historical DAAMS QP sample will be collected and analyzed daily from each historical DAAMS station. The QP will be spiked by air monitoring personnel at approximately a 1 TWA mass equivalent and placed into the sample field. Additionally, **confirmation** DAAMS QP samples will be performed such that all **confirmation** DAAMS stations have a minimum of 1 QP sample for the operational workweek. MCL personnel will perform the analysis of all DAAMS QP samples. Results deviating by more than 25 percent from the monitoring level will be reported immediately to MMD-1 senior chemist for implementation of corrective action. All QP results will be control charted for statistical observation.

1.7.5 MMD-1 Closeout Air Monitoring. After completion of MMD-1 testing, air monitoring will be performed on selected structures and equipment in accordance with the Closure Plan.

1.8 Equipment Support Requirements

1.8.1 MINICAMS®. The following will be considered during MINICAMS® operations:

a. *Electrical Requirements.* The MINICAMS® power supply will satisfy the MINICAMS® Operation and Maintenance Manual requirements. **MINICAMS will have an uninterrupted power source for continuous monitioring.**

b. *Interferences.*

(1) *Chemical Interferences.* To minimize the likelihood of false alarms, the exposure of the monitors to vehicle exhaust, forklift exhaust, and diesel generator exhaust will be minimized. Vehicle and equipment exhausts will be minimized by operating vehicles in Building 3445 only when necessary.

MINICAMS® will be used only in a noncorrosive environment and will not to be used to sample freshly prepared corrosive decontamination solutions. Items that have been decontaminated are allowed to dry before sampling.

(2) *Electrical Interferences.* Hand-held radios or cellular phones will not be operated within 15 feet of the MINICAMS® (the radio frequencies interfere with the proper operation of the analytical equipment). Signs will be posted at a 15-foot radius around the MINICAMS®, warning site personnel not to use hand-held radios or cellular phones beyond the posted point.

c. *Heat-traced Sample Transfer Lines.* Heat-traced sample transfer lines will be located in cable trays, if necessary, to prevent damage by routine foot and vehicle traffic.

d. *Preconcentrator Tubes.* The solid sorbent tube used to collect the sample in the MINICAMS® is referred to as a PCT. The PCT will be replaced at a minimum of every 7 calendar days. The PCT will also be replaced after two successive challenge failures and before recalibration. New PCTs will be preconditioned before MINICAMS® calibration by cycling through sample and analysis until a flat baseline is established. Preconditioning will be complete once the baseline has stabilized.

e. *Compressed Gases.* The compressed gases required for MINICAMS® operation (hydrogen, air, and nitrogen) will be located outside the monitoring room. Compressed CG for calibrating and challenging the CG MINICAMS® may be located within the monitoring room. MINICAMS® support gases are required to be at least 99.99 percent pure. MINICAMS® compressed gases will be purified further by filtering all three

compressed gases through a gas conditioning system before connecting them to the MINICAMS®.

All gas fittings will be leak-checked on a routine basis as documented in the preventive maintenance procedures. An electronic leak detector (Gow Mac or equivalent) may be used to detect any leaks and to verify the integrity of the compressed gas lines. A soap solution will only be used to leak-check the gas cylinder regulator connections; soap will not be used when leak-checking the MINICAMS® compressed gas lines or fitting.

f. *Environmental Temperature.* The MINICAMS® will be maintained at a temperature between 15 and 40±C (59 and 104±F) during operation by the heating, ventilation, and air conditioning (HVAC) system.

g. *Vacuum Pump.* The MINICAMS® requires an oilless pump supplied by the MINICAMS® manufacturer to be used as sample pumps. Two pumps located inside the East Test Chamber will provide sample flow for all MINICAMS® located in the monitoring room. Two additional pumps, also located in the East Test Chamber, will provide sample flow for the UPA gross-level MINICAMS®. Vacuum pump exhaust lines will be routed to a carbon filter unit inlet. The preventive maintenance responsibilities for the MINICAMS® vacuum pump will be the responsibility of NSSC.

h. *Calibration and Challenge Solutions.* Challenging the MINICAMS® requires the use of chemical standard reference solutions. All chemical solutions will be transported in a container to preclude breakage and provide secondary containment. The vial is labeled in accordance with the OSHA Employee Right-to-Know labeling requirements, Army Regulation (AR) 385-61, and states the contents of the vial and the vial tracking number. The vial is placed in the carrier. Chemical agent standards will be stored at a nominal 4±C. An agent custodian from the MCL will maintain custody of all chemical agent standards. An alternate agent custodian will be assigned to assume custody responsibilities in the event the primary custodian is unavailable. Discarded chemical agent standards will be decontaminated in accordance with approved procedures. Generator knowledge will be provided for waste management purposes.

i. *Syringes.* Syringes will be used to calibrate analytical instrumentation and spike QC samples. Syringe selection will be based on the amount of solution to be injected. Injection volumes will not be below 20 percent or exceed 80 percent of the total syringe volume. Syringes will be labeled for each chemical agent specific to the current campaign.

1.8.2 Depot Area Air Monitoring System. The following will be considered when operating DAAMS stations:

a. *Electrical.* The DAAMS stations will be supplied appropriate power to sustain operation during MMD-1 testing. **DAAMS stations will be connected to an uninterrupted power supply for continuous monitoring.**

b. *Chemical Interferences.* In order to minimize the likelihood of false positive samples, exposure of the DAAMS tubes to vehicle exhaust, forklift exhaust, and diesel generator exhaust, will be minimized.

c. *Heat-traced Sample Lines.* All DAAMS heat-traced sample transfer line requirements are consistent with those described for MINICAMS®.

d. *DAAMS Sample Tubes.* An HP Dynatherm compatible DAAMS tube will be used to collect the sample in the DAAMS sample station. Before being placed in the field, every DAAMS sample tube will be visually inspected for proper bed depth, proper bed location, proper sorbent color, and the absence of gaps in the sample bed. If the DAAMS sample tube fails the visual inspection, it will be disposed of immediately. The pressure drop across individual sample lots of DAAMS tubes, documented by the DAAMS tube manufacturer or the MCL, will also be checked for acceptability. A record of the manufacturer or MCL certification of performing the pressure drop test will be maintained by MCL personnel. Prior to implementing new DAAMS tube lots, DAAMS tubes will undergo chemical agent testing by spiking and analyzing DAAMS tubes with the lowest monitoring level mass equivalent. Acceptance of the agent test will be in accordance with the American National Standards Institute/American Society for Quality Control (ANSI/ASQC) Z1.4-1993 testing procedure.

   One out of every ten re-conditioned tubes will be analyzed to verify no detectable peaks above the method limit of quantification are observed within the agent retention time window prior to placement in the field.

e. *Environmental Temperature.* DAAMS tubes will operate within the environmental conditions specified by the manufacturer. The vacuum pump motors at the DAAMS sample stations are rated for operation in an ambient temperature of 40±C (104±F). All DAAMS sample stations are located within the East Test Chamber or within the MCL.

f. *Sample Station Vacuum Pump.* The vacuum pump will be capable of supplying the necessary flow rates for each DAAMS station.

g. *Challenge Solutions.* Challenging of the DAAMS sample station requires the use of chemical standard reference solutions. A MINICAMS® may be used to challenge DAAMS heat-traced sample transfer lines. The challenge result will be ″25 percent of the referenced MINICAMS® challenge.

h. *Syringes.* Syringes used to spike agents on DAAMS apparatus will satisfy the requirements identified in paragraph 1.8.1i.

1.8.3 Colorimetric Tubes. Colorimetric tubes will be used to confirm CG MINICAMS® alarms. Prior to using a specific lot number of colorimetric tubes and monthly thereafter, one colorimetric tube from that specific lot **of less than 200 tubes** will be challenged with a 1 TWA vapor equivalent challenge. The color indication of the colorimetric tube will provide a response within ″25 percent of the target concentration. If not, corrective action is initiated and additional colorimetric tubes will be challenged. When collecting colorimetric tube samples, the following will be considered:

a. *Observation periods.* Tubes are observed continuously during the measurement, and the indication is evaluated immediately following the measurement according to the instructions for use.

b. *Lighting.* Where possible, the tubes are not stored in direct sunlight to prevent degradation of the tubes. To aid in observation, the tube may be held against a piece of white paper or other light-colored background and compared with an unused tube.

c. *Nondistinct Endpoint.* If colorimetric sample results are not readily interpretable, a second sample is collected on a new colorimetric tube. If the problem persists, the following applies:

- In the event of a nondistinct endpoint, the entire length of the discoloration is read, and all colors noted.
- If the color indication runs at a slant to the tube, the concentration is read as the average endpoint.
- If the color is progressively diffuse, the lowest point of clear discoloration will indicate the concentration to be reported.

d. *Humidity.* Upper and lower humidity limits are provided in the operating instructions for the specific tube. If the measured humidity is outside these limits, the tube will not be used and the Site Manager or SSHO will be notified.

e. *Temperature.* The ambient operational temperature limits will be provided in the operating instructions for specific tubes. If the measured temperature is outside these limits, the tube is not used and the Site Manager or SSHO will be notified.

f. *Expiration Dates.* The expiration date will be placed on the detector tube box and will be checked before use. Expired tubes will not be used. Previously opened tubes will not be used, even if the indicator is not stained.

g. *Pump.* The pump will be checked periodically for leaks. The pump volume will be calibrated quarterly, according to manufacturer's recommendations, if necessary.

h. *Storage.* Tubes will be stored between 0 and 25±C (32 and 77±F), in accordance with manufacturer's recommendations.

i. *Disposal.* Tubes that have been used will be discarded and managed appropriately.

1.9 Chemical Materiel Alarm Response

MMD-1 chemical materiel alarms indicate that potential chemical materiel vapors are present. MMD-1 MINICAMS® alarm response requires MMD-1 air monitoring personnel to respond for confirmation sample collection and analysis. All confirmation results will be provided to the MMD-1 Site Manager and SSHO. Confirmed responses at or above **0.2** TWA between carbon filter elements requires "bag-in/bag-out" procedures to be performed on both carbon filter elements.

NOTE: Any MINICAMS® alarm (DPG or NSSC) will be considered a valid alarm until disproven.

The MINICAMS® alarm will be an audible and visual alarm located at the MINICAMS® unit. The MINI-NET™ system receives information from the MINICAMS® and will provide alarm capabilities to four annunciator alarm panels at the following locations:

- Control room
- West Test Chamber

- East Test Chamber
- Control trailer exterior.

When a MINICAMS® alarm is encountered, air monitoring personnel will observe real-time chromatograms using the MINI-LINK™. MINI-LINK™ data will be routinely archived in accordance with PMNSCM approved procedures.

1.9.1 Chemical Agent Confirmation. MINICAMS® confirmation sample collection for chemical agent (GB, VX, and HD) includes collecting the collocated DAAMS tubes, replacing the collected DAAMS tubes with unsampled DAAMS tubes, and analyzing the DAAMS sample tube for chemical agent. Prior to DAAMS sample collection, the predicted found agent mass will be calculated. Calculation of the predicted found agent mass will be based on the sample volume collected during alarm condition (lowest flow rate used) and the average MINICAMS® concentration observed during alarm status. Calculation of the predicted found mass ensures that the expected agent mass is above analytical method detection limits. **All Confirmation DAAMS tubes are able to detect agent at 0.2 TWA for one cycle.**

Confirmation of a DAAMS response at a historical DAAMS only station requires analysis of the sample duplicate on a different stationary phase analytical column or different analytical detector type.

1.9.2 Phosgene Confirmation. CG MINICAMS® alarms are confirmed by colorimetric tubes. When a CG MINICAMS® alarm occurs, air monitoring personnel respond to the collocated DAAMS station for colorimetric tube sample collection. Quick response is critical because sample collection should be performed while the MINICAMS® unit is still in alarm. If the MINICAMS® unit has cleared its alarm status, the colorimetric tube will continue to be collected, but the colorimetric tube results will not be considered conclusive if a negative response is observed. The MINICAMS® alarm will be considered valid until additional operational information can prove otherwise.

1.10 Preventive Maintenance

Preventive maintenance ensures that the sampling and analysis equipment is in the proper operating condition, and prevents problems before they affect the validity of the data. As a minimum, hardware associated with sampling and analysis will be maintained in accordance with the manufacturer's recommendations. The preventive maintenance activities will be documented and supported by a preventive maintenance schedule.

For analytical equipment located in the MCL, preventive maintenance will be performed in accordance with the manufacturer's recommendation and on an as-needed basis as deemed necessary by the MCL chemist.

The instrument, including manufacturer, model, accessories, etc., will be specified in the preventive maintenance records. Preventive maintenance will only be performed by qualified personnel.

Preventive maintenance records will consist of documentation proving that the manufacturer's preventive maintenance recommendation was followed. A preventive maintenance schedule will be generated and followed during the test. The preventive maintenance records will be maintained by the NSSC and will include information on the replacement of parts or the adjustment of an instrument during routine operations.

1.11 Corrective Action

Corrective action will be initiated through the development and implementation of routine internal QC checks. Corrective action will be initiated when potential or existing conditions are identified that may adversely impact data quality. Events that require corrective action to be taken include violation of approved analytical procedures, violation of approved SOPs, out-of-control conditions, absence of proper documentation, inability to attain data quality objectives (DQOs), and quality assurance findings.

The need for corrective action will be documented immediately and reported to the MMD-1 Site Manager. The corrective action may be immediate or long-term. An immediate corrective action may be the recalculation of results, re-analysis of samples, or repeat of sample collection. A long-term corrective action may include an increase in QC samples, more frequent calibrations, implementation of additional control charts, acquisition of additional backup equipment, and/or revision or update of SOPs to reflect current practices.

All corrective actions taken will be documented in the appropriate instrument logbook. If the DQOs cannot be satisfied, the data are analyzed to identify the usability of the information generated. If necessary, the DQOs may need to be revised to meet personnel, equipment, or analytical method capabilities.